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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/197,767	11/23/1998	HISASHI OHTANI	0756-1896	1677
31780	7590	07/14/2004	EXAMINER	
ERIC ROBINSON PMB 955 21010 SOUTHBANK ST. POTOMAC FALLS, VA 20165			CAO, PHAT X	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 07/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/197,767	OHTANI ET AL. <i>OK</i>	
	Examiner	Art Unit	
	Phat X. Cao	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 April 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 16, 22-27, 40 and 46-74 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 16, 22-27, 40 and 46-74 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>11/03 & 4/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 1-2, 5, 16, 22-27, 40, 47-48, 51-52, 55-56, 59-60, 63-64, 67-68 and 71-72 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

- In the independent claims 1-2 and 47-48, the limitation of comprising a reflective pixel electrode "having a flat upper surface thereon" is not supported by the original disclosure. For example, the present invention (Figs. 1B-1C and specification at page 4) discloses the forming of an embedded conductive layer 104 having a flat upper surface and the forming of an electrode 105 on the flat contact part 106 (specification at page 12, lines 12-19) of the embedded conductive layer 104, but not disclose the forming of a reflective pixel electrode "having a flat **upper** surface thereon" as amended.

- dependent claims 5, 16, 22-27, 40, 51-52, 55-56, 59-60, 63-64, 67-68 and 71-72 are also rejected because they directly or indirectly depend on independent claims 1-2 and 47-48.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 47, 51, 55, 59, 63, 67-68 and 71-72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US. 5,536,950) in view of Fukunaga et al (US. 5,706,064) and Izumi (US. 6,400,428).

With respect to claims 1, 47, 51, 55, 59, and 63, Liu et al disclose in Fig. 4G a semiconductor device comprising: a transistor; at least one interlayer insulating film 78 formed over the transistor, the interlayer insulating film 78 having a contact hole; an embedded conductive layer 82 provided to fill the contact hole wherein a top surface of the embedded conductive layer 82 is flush with a top surface of the interlayer insulating film 78; and a pixel electrode TM2 having a flat upper surface thereon (see pixel electrode 24 in Fig. 3 and column 5, lines 37-39), and formed on the interlayer insulating film 78 wherein the pixel electrode TM2 is electrically connected to the transistor through the embedded conductive layer 82.

Liu et al do not disclose the embedded conductive layer 82 being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61).

Accordingly, it would have been obvious to form Liu's embedded conductive layer with the materials as set forth above, because such materials would provide a color liquid crystal display devices having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34). Furthermore, it also would have been obvious to form Liu's pixel electrode being either a transparent electrically conductive film or a reflective electrical conductive film depending upon the display device type which is desired for the liquid crystal display device, as taught by Izumi (column 6, lines 15-20).

With respect to claims 67-68 and 71-72, Fukunaga et al (Fig. 17) further teach the obviousness of forming an embedded conductive layer 411b comprising a same resin as the resin of the interlayer insulating film 413 (see column 19, lines 27-35 and column 42, lines 50-52), wherein the embedded conductive layer 411b comprises an organic resin film containing a conductive material dispersed therein or an inorganic film containing a conductive material disperse therein (column 41, lines 22-32).

3. Claims 2, 22-27, 40, 48, 52, 56, 60 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al in view of Yamazaki (US. 5,990,542), Fukunaga et al and Izumi (US. 6,400,428).

With respect to claims 2, 48, 52, 56, 60, and 64, as discussed above, Fig. 4G of Liu et al substantially reads on the claimed invention, except that it does not disclose the interlayer insulating film 78 comprising an organic resin.

However, Yamazaki teaches in Fig. 2B the obviousness of forming the interlayer insulating film 120 made of organic resin (column 5, lines 65-67). Accordingly, it would have been obvious to form the interlayer insulating film 78 of Liu et al with an organic resin, because according to Yamazaki, the interlayer insulating film made of the organic

resin would suppress an electric field from the pixel electrode created later from being disturbed (column 6, lines 1-6).

Neither Liu nor Yamazaki discloses the embedded conductive layer being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form Liu's embedded conductive layer with the materials as set forth above, because such materials would provide a color liquid crystal display devices having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34). Furthermore, it also would have been obvious to form Liu's pixel electrode being either a transparent electrically conductive film or a reflective electrical conductive film depending upon the display device type which is desired for the liquid crystal display device, as taught by Izumi (column 6, lines 15-20).

With respect to claims 22-27 and 40, Fukunaga et al also teach in column 1, lines 5-30 that because the liquid crystal display device has high image quality and can be used as switching elements, this kind of display device has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to one ordinary skill in the art to apply the display device of Fukunaga et al to a display device of a cellular phone, a camcorder, etc., because it is an intended use.

4. Claims 3, 22-27, 40, 49, 53, 57, 61, 65, 69-70, and 73-74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (US. 6,081,305) in view of Okita

(US. 6,097,453), Fukunaga et al and Miyawaki et al (US. 5,644,370 - previous cited by Applicant).

With respect to claims 3, 49, 53, 57, 61, and 65, Sato et al disclose in Fig. 2 a semiconductor device comprising: a transistor; a first interlayer insulating film 130 formed over the transistor; a drain electrode 141 formed on the first interlayer insulating film and electrically connected to a drain of the transistor through an opening of the first interlayer insulating film; a second interlayer insulating film 150 formed over the drain electrode and the first insulating film; a capacitor forming electrode 165 formed on the second interlayer insulating film 150 to form a capacitor between the drain electrode 141 and the capacitor forming electrode 165; a third interlayer insulating film 170 formed over the capacitor forming electrode and the second interlayer insulating film; contact holes 171 and 151 opened through the third and second interlayer insulating films to reach the drain electrode; an embedded conductive layer filled in the contact holes; and a reflective pixel electrode 181 is electrically connected to the drain electrode through the embedded conductive layer.

Sato et al do not disclose that the contact holes 171 and 151 are formed as a single contact hole opened through the third and second insulating films.

However, Okita teaches in Fig. 6 the obviousness of forming a single contact hole 508 opened through the third insulating film 109 and second insulating film 601 to reach the drain electrode 108. Accordingly, it would have been obvious to modify the contact holes 171 and 151 of Sato et al by forming a single contact hole, because as is well known, the forming of a single contact hole as taught by Okita would reduce the number of steps in fabricating process.

Neither Sato nor Okita discloses the embedded conductive layer being made from the materials as claimed.

However, Fukunaga et al, in Fig. 24, teach that the embedded conductive layer 418 is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form Sato's embedded conductive layer with the materials as set forth above, because such materials would provide a color liquid crystal display devices having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34). Fukunaga's Fig. 24 further teaches the forming of tapered opening because such tapered opening would provide the good connections between the source/drain region and the pixel electrode, as taught by Miyawaki (see Fig. 9 and column 10, lines 11-21).

With respect to claims 22-27 and 40, Fukunaga et al also teach in column 1, lines 5-30 that because the liquid crystal display device has high image quality and can be used as switching elements, this kind of display device has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to one ordinary skill in the art to apply the display device of Fukunaga et al to a display device of a cellular phone, a camcorder, etc., because it is an intended use.

With respect to claims 69-70 and 73-74, Fukunaga et al (Fig. 17) further teach the obviousness of forming an embedded conductive layer 411b comprising a same resin as the resin of the interlayer insulating film 413 (see column 19, lines 27-35 and column 42, lines 50-52), wherein the embedded conductive layer 411b comprises an organic resin film containing a conductive material dispersed therein or an inorganic film containing a conductive material disperse therein (column 41, lines 22-32).

5. Claims 4 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al in view of Okita, Miyawaki et al and Yamazaki (US. 5,990,542).

As discussed in details above, the combination of Sato et al, Okita and Miyawaki substantially reads on the claimed invention, including the known feature of forming a material normally used for the electrode (i.e., pixel electrode) in the semiconductor and TFT processes, such as aluminum (as taught by Okita, in column 6, lines 15-19).

The above combination does not disclose the third interlayer insulating film comprising an organic resin.

However, Yamazaki teaches in Fig. 2B the obviousness of forming the ITO pixel electrode on the interlayer insulating film 120 made of organic resin (column 5, lines 65-67). Accordingly, it would have been obvious to form the interlayer insulating film 170 of Sato et al with an organic resin, because according to Yamazaki, the interlayer insulating film made of the organic resin would suppress an electric field from the pixel electrode created later from being disturbed (column 6, lines 1-6).

6. Claims 54, 58, 62 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al, Okita, Miyawaki et al and Yamazaki as applied to claim (4,50) above, and further in view of Fukunaga et al.

None of the above references discloses the embedded conductive layer being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-38) or polymer (column 26, lines 54-61).

Accordingly, it would have been obvious to form Sato's embedded conductive layer with

the materials as set forth above, because such materials would provide a color liquid crystal display device having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34).

7. Claims 5, 16, 22-27, 40 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al in view of Fukunaga et al (US. 5,706,064) and Izumi (US. 6,400,428).

With respect to claims 5 and 46, as discussed above, Fig. 4G of Liu et al substantially reads on the claimed invention, except it does not disclose that the embedded conductive layer comprises a same resin as the resin of the interlayer insulating film.

However, Fukunaga et al teach in Fig. 17 the obviousness of forming an embedded conductive layer 411b comprising a same resin as the resin of the interlayer insulating film 413 (see column 19, lines 27-35 and column 42, lines 50-52), wherein the embedded conductive layer 411b comprises an organic resin film containing a conductive material dispersed therein or an inorganic film containing a conductive material disperse therein (column 41, lines 22-32). Accordingly, it would have been obvious to form the embedded conductive layer and the interlayer insulating film with the resin as set forth above, in order to provide a substrate for a display device which can be used in liquid crystal in a high speed response mode and achieves a low price, such as taught by Fukunaga et al (column 1, lines 55-59). Furthermore, it also would have been obvious to form Liu's pixel electrode being either a transparent electrically conductive film or a reflective electrical conductive film depending upon the display device type which is desired for the liquid crystal display device, as taught by Izumi (column 6, lines 15-20).

With respect to claim 16, Fukunaga et al further teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61), and one of the two conductive layers is in contact with an alignment film 517 (number 517 not shown in Fig. 17, see Fig. 27).

With respect to claims 22-27 and 40, Fukunaga et al also teach in column 1, lines 5-30 that because the liquid crystal display device has high image quality and can be used as switching elements, this kind of display device has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to one ordinary skill in the art to apply the display device of Fukunaga et al to a display device of a cellular phone, a camcorder, etc., because it is an intended use.

8. Claims 1-2, 5, 22-27, 40, 47-48, 51-52, 55-56, 59-60, 63-64, 67-68 and 71-72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukunaga et al (US. 5,706,064) in view of Liu et al (US. 5,536,950) and Izumi (US. 6,400,428).

With respect to claims 1-2, 5, 47-48, 51-52, 55-56, 59-60, 63-64, 67-68 and 71-72, Fukunaga (Figs. 24A - 24G) discloses a semiconductor device having an active matrix display device, comprising: forming a first conductive layer 405; forming an insulating layer (413,414) over the first conductive layer; forming an opening in the insulating layer to expose the first conductive layer 405 at a bottom of the opening; forming an embedded conductive layer 418 to cover the insulating layer and the opening (Fig. 24E); etching the embedded conductive layer 418 (Fig. 24F); and forming a second conductive layer on the insulating layer and the embedded conductive layer; and forming a light pixel electrode 412 by patterning the second conductive layer

(column 26, lines 46-48); wherein the pixel electrode 412 is electrically connected to the transistor through the embedded conductive layer 418 or 411b, wherein the embedded conductive layer 418 or 411b comprises an organic resin film made of polymer (column 26, lines 54-61) or carbon (column 20, lines 36-48) which is the same resin as the resin of the interlayer insulating film (column 19, lines 27-35 and column 20, lines 31-57), and wherein the embedded conductive layer 418 or 411b is further made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3).

Fukunaga does not disclose the top surface of the embedded conductive layer being flush with the top surface of the interlayer insulating film.

However, Liu (Fig. 4G) teaches the steps of depositing the embedded conductive layer 82 in the opening, followed by planarization to flush the top surface of the embedded conductive layer with the top surface of the interlayer insulating film 78, and depositing and patterning the pixel electrode 24 having a flat upper surface thereon (also see Fig. 3) on the embedded conductive layer 82 (column 5, lines 30-39). Accordingly, it would have been obvious to form the embedded conductive layer 418 of Fukunaga being flush with the top surface of the interlayer insulating film in order to provide a unique body tie arrangement for achieving a compact and high reliability display, as taught by Liu (column 2, lines 57-67 through column 3, lines 1-12). Furthermore, it also would have been obvious to form Fukunaga's pixel electrode being either a transparent electrically conductive film or a reflective electrical conductive film depending upon the display device type which is desired for the liquid crystal display device, as taught by Izumi (column 6, lines 15-20).

With respect to claims 22-27 and 40, Fukunaga also teaches that because the liquid crystal display device has high image quality and can be used as switching elements, this kind of display has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to apply the display device of Fukunaga to a cellular phone, a camcorder, etc., because it is an intended use.

Response to Arguments

9. Applicant argues that it would not be obvious to change Liu's device from a transmissive-type LCD to a reflective-type LCD by replacing Liu's transparent pixel electrode with the reflective pixel electrode as suggested by Izumi.

This argument is not persuasive because the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, the combined teachings of the references would have suggested to those of ordinary skill in the art because Izumi clearly suggests that the display device electrode of Liu can have a pixel electrode made of either a transparent electrically conductive film or a reflective electrically conductive film depending upon the display device type which is desired for the liquid crystal display device (column 6, lines 15-20). Specifically, Izumi states in column 6, lines 14-19 that:

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"Each pixel electrode 15 is a transparent electrically conductive film made of ITO (Indium Tin Oxide) or the like when used for a light transmitting type display device and a reflective electrically conductive film made of aluminum (Al) or the like when used for a reflecting type display device."

In response to Applicant's argument that the applied references do not suggest the invention as amended, the new ground of rejection is applied.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (571) 272-1703. The examiner can normally be reached on Monday - Thursday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PC
July 9, 2004


PHAT X. CAO
PRIMARY EXAMINER